PATENT
8017-1141

IN THE U.S. PATENT AND TRADEMARK OFFICE

In re application of

Hiroshi KANETA et al. Conf. 7384

Application No. 10/505,417 Group 1795

Filed August 24, 2004 Examiner C. Lee

SECONDARY BATTERY HAVING THIRD TERMINAL IN ADDITION TO POSITIVE AND NEGATIVE ELECTRODE TERMINALS AND STORAGE BATTERY USING THE SAME

DECLARATION UNDER 37 CFR §1.131

Assistant Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

We, Hiroshi Kaneta and Chika Kanbe, do hereby state as follows:

We are the inventors of the invention disclosed and claimed in the above-identified application.

We understand that U.S. Patent Publication 2003/0194604 to Aamodt et al., which has an effective filing date of April 15, 2002, has been cited by the U.S. Patent and Trademark Office in support of its rejection under §103(a) of all claims in the above-identified application, namely claims 2-3, 5-8, and 11-22.

Our invention disclosed in the above-identified application and defined in claims 2-3, 5-8, and 11-22 was invented prior to April 15, 2002.

Our invention was made and completed in Japan, a WTO member country, and actually reduced to practice prior to April 15, 2002, or was conceived prior April 15, 2002, coupled with due diligence from prior to April 15, 2002 to the April 24, 2002 filing date of the priority Japanese application 2002-122678, as evidenced by the attached exhibit.

The exhibit is a copy of the draft specification of the priority Japanese application that was completed on April 1, 2002, and an English translation thereof. As is apparent, the invention disclosed and claimed in the above-identified application is disclosed in the draft specification. The April 1, 2002 completion date of the draft specification is prior to the April 15, 2002 effective filing date of Aamodt et al.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section

1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Hiroshi Kaneta	May 11. 2010
Hiroshi Kaneta	date
Chika Kanbe	May 11, 2010
Chika Kanbe	date

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of
Hiroshi Kaneta et al.
Application No. 10/506,417
Filed August 25, 2004

for: "SECONDARY BATTERY HAVING THIRD TERMINAL IN ADDITION TO POSITIVE AND NEGATIVE ELECTODE TERMINALS AND STORAGE BATTERY USING THE SAME"

DECLARATION

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

I, Kazuyuki SUZUKI residing at c/o WAKABAYASHI PATENT AGENCY, 16th Kowa Bldg., No. 9-20, Akasaka 1-chome, Minato-ku, Tokyo, Japan, do solemnly and sincerely declare:

1. that I am well both the Japanese Language and English Languages; and
2. that the attached document:
   the draft specification of the inventors dated April, 1 2002 that corresponds to Japanese Patent Application No. 2002-122638 is a true and faithful translation into the English Language made by me.

And I, Kazuyuki SUZUKI being sworn state that the facts set forth above are true.

Dated: on this 18th day of May, 2010. Tokyo, Japan

May 18, 2010
Date

Kazuyuki Suzuki
Kazuyuki SUZUKI

[Document Name] Specification

[Title of the Invention] Secondary Battery and Storage Battery using the same

[Claims]

[Claim 1]

A flat secondary battery comprising:

a third terminal formed to extend directly from either one of said positive and negative electrode collectors of an electric-power generating element in addition to positive and negative electrode terminals for charge and discharge extending from the electric-power generating element.

[Claim 2]

The flat secondary battery according to claim 1, wherein the third terminal is formed to extend in the direction that is perpendicular to the extension sides of the positive and negative electrode terminals for charge and discharge.

[Claim 3]

The flat secondary battery according to claim 1 or 2, wherein the electric-power generating element is constructed by alternately stacking anode elements and cathode elements with separators interposed between them.

[Claim 4]

The flat secondary battery according to any one of claims 1 to 3, wherein a casing is made of a laminate film.

[Claim 5]

A storage battery of a serial type using a plurality of flat secondary batteries according to any one of claims 2 to 4.

[Detailed Description of the Invention]

[Field of the Invention]

The present invention relates to a structure of a secondary battery, in particular, to a method of extending a terminal from the secondary battery. In addition, the present invention relates to a storage battery made up of the secondary batteries.

[Background Art]

Recently, demand has increased for a battery having medium/large storage capacity and comprised of secondary batteries. Specifically, demand has grown for such batteries that can be used in applications that include electric bicycles, electric bikes and electric motorcars, and the attention has been focused on batteries having medium power of a 100W to 1000W class and also batteries having large power higher than 1000W.

Conventionally, the storage batteries have been prevalent that are made up of a combination of many lead or nickel hydrogen cells and that are large in size, low in weight and volume density, and that are high in costs. However, as a demand for a storage battery of high power has been growing, a storage battery of a low cost, having high weight and volume densities and capable of consuming high power has been desired. In the meantime, a high-voltage lithium ion secondary battery, which serves as an elemental cell, has recently been realized, so that a secondary battery, in which a lightweight laminate film is used as a casing, has become prevalent.

Therefore, there is a need to develop a small-sized and lightweight storage battery of high power using lightweight and high capacity lithium ion secondary batteries in which a lightweight laminate film is used as a casing.

In particular, since rapid charge/discharge characteristics as well as a high cycle life are required for a storage battery that is used for an automobile car, there are many problems that need to be quickly solved such as: the lowering of the internal resistance of the battery; a heat-generation problem due to rapid charging; problems in the control of the cell balance in the interior of the battery; and the realization of a highly precise cycle-life predicting circuit.

[Problem to Be Solved by the Invention]

The problems to be solved are to achieve reduction of the internal resistance of a storage battery as well as to improve the accuracy in the measurement of the temperature rise (or heat generation) in a secondary battery caused by a rapid charge/discharge operation of the battery and to provide a structure of a secondary battery structure that allows easy construction of a storage battery.

[Object of the Invention]

It is an object of the present invention to provide a structure of a secondary battery enabling a change in temperatures of the secondary battery to be accurately detected, thereby allowing easy construction of a storage battery having reduced internal resistance.

[Means to Solve the Problem]

FIG. 2 shows a secondary battery of the prior art. FIG. 2 shows an example of a flat secondary battery in which a laminate film is used as a casing. FIG. 1 shows a secondary battery according to an embodiment of the invention. As shown in FIG. 1, a third terminal is attached to extend from a sealed side of a laminate film.

At this time, the third terminal is connected to an electric-power generating element constituting the secondary battery and is formed to have the same potential as

either the positive or negative electrode.

In this way, it is possible to achieve the object just by adding one step to a process of fabricating a secondary battery without making any significant changes to the shape of the conventional secondary battery.

[Operation (working of means for effects)]

FIG. 2 shows a secondary battery of the prior art. FIG. 2 shows an example of a flat secondary battery in which a laminate film is used as a casing. FIG. 1 shows a secondary battery according to an embodiment of the present invention. As shown in FIG. 1, the secondary battery according to an embodiment of the present invention has such a shape that a third terminal 4 is formed to extend from a sealed side of a laminate film in the conventional secondary battery.

The third terminal 4 is connected to uncoated sections 2a or 3a of electric-power generating element 8 constituting the secondary battery and has the same potential as either anode element 5 or cathode element 6.

In this way, it is possible to solve the below problems just by adding one step to a process of fabricating a secondary battery without making any significant changes to the shape of the conventional secondary battery.

First, since the third terminal is connected to the electric-power generating element constituting the secondary battery, it is possible to accurately detect the internal temperature of the secondary battery, i.e., the temperature of the electric-power generating element. In the conventional secondary battery as shown in FIG. 2, it has been common to perform the measurement of the internal temperature by setting a temperature sensor either on a surface layer of the secondary battery or on the positive/negative electrode terminal. Mounting a temperature sensor on a surface layer of the secondary battery, however, makes it difficult to stack a plurality of secondary batteries when building a storage battery, because the stack arrangement of flat secondary batteries each with a laminate film casing has temperature sensors interposed between the secondary batteries, which could result in detecting average temperatures between the stacked secondary batteries, or which cause could damage to the secondary battery itself. In some cases, an arrangement has been adopted in which elastic material such as sponge sheets are sandwiched between the secondary batteries, in order to stack secondary batteries in which contact with the temperature sensors is avoided. The arrangement, however, entails not only lowering weight and volume densities but also increasing in the number of processes for constructing the storage battery as well as increasing the component costs. Attaching a temperature

sensor to an electrode terminal, on the other hand, requires an extra long terminal. Consequently, construction of the storage battery requires a larger volume to accommodate the extra length of terminal, entailing the lowering of volume density. Furthermore, heat generated in the electrode terminal by the rapid charge/discharge operation causes the temperature sensor to detect the temperature of the electrode terminal rather than the temperature in the interior of the secondary battery. This has been responsible for the occurrence of deviation in the life prediction of the secondary battery.

Furthermore, extending the third terminal from the side perpendicular to the extension sides of the positive and negative electrode terminals facilitates the installation of the cell balancer circuit in constructing the battery. The reason for this is that, since the third terminal has the same potential as either the positive or negative electrode, the third terminal can be used for the connection with a control system such as a cell balancer, while making an inter-cell connection through individual direct connections of the positive electrode terminals and the negative electrode terminals of the secondary batteries, when the storage battery is built up. It in not necessary to draw out the lead wires for the cell-balancer circuit when the cells are connected to one another or to make a connection between cells through a bus-bar and then to draw out the lead wires for the cell-balancer circuit from the bus-bar, which has been commonly practiced. Accordingly, it is possible to accurately measure the temperature in the interior of the cell through the use of the flat laminate-film secondary battery of the present invention without depending on the construction method of the storage battery and to reduce the extra member or space, thereby improving the weight and volume densities. Furthermore, since the inter-cell connection is realized by the direct connections of the terminals, it is possible to reduce the internal resistance of a storage battery. Since it is possible to facilitate the installation of a control system such as a cell balancer circuit and the like, thereby simplifying the manufacturing process of a storage battery and further reducing a production cost.

[Preferred Embodiments of the Invention]

An embodiment of the present invention will be described with reference to FIGS. 1 to 5. As shown in FIG. 1, according to the present invention, a third terminal 4 is provided to a flat laminate-film secondary battery 1. The third terminal is constructed as described below.

First, anode elements 5 and cathode elements 6 are alternately stacked with separators 7 interposed between them, thereby forming an electric-power generating element 8, as shown in Fig. 3. Next, a positive electrode terminal 2 and a negative electrode terminal 3 are attached to uncoated sections (electrode collectors) 2a and 3a, free

of active material, of anode elements 5 and cathode elements 6 of the electric-power generating element 8, respectively, as shown in Fig. 4. Next, a third terminal 4 is directly connected to either uncoated section 2a of anode elements 5 or uncoated section 3a of cathode elements 6. For convenience of explanation, it is assumed that third terminal 4 is connected to uncoated sections 2a of the anode elements. At this time, third terminal 4 is attached in such a way that it does not contact positive electrode terminal 2. It is desirable to separate both the terminals as far as possible from each other in order to minimize the influence on third terminal 4 of any heat generation possibly generated in positive electrode terminal 2 by rapid charge. After that, as shown in FIG. 5, electric-power generating element 8, in which positive and negative electrode terminals 2 and 3 and third terminal 4 are incorporated, is wrapped with laminate-film casing 9, which is sealed on three sides by means of hot-melt fusion-bonding, and thereafter, non-aqueous electrolyte is injected into laminate-film casing 9, which is then completely sealed under reduced pressure, as in the conventional process of fabricating a laminate-film secondary battery. As a result, a flat laminate-film secondary battery is fabricated.

Hereinafter, a first embodiment of the present invention will be described with reference to FIGS. 3 to 5. First, as shown in FIG. 3, anode elements 5 and cathode elements 6 are alternately stacked with separator 7 interposed between the anode and cathode elements and also with their electrode collectors (uncoated sections) 2a and 2b extended outwards from the same side, wherein each of cathode elements 6 comprises a sheet of copper foil 15 μm thick to which is applied, on both faces, approximately 50 μm-thick hard-carbon based cathode active material that occludes/releases a lithium ion; each of the anode elements 5 comprises a sheet of aluminum foil that is 20 μm in thickness to which is applied, on both faces, lithium-ion containing metal oxide material that occludes/releases a lithium ion, such as lithium-manganese composite oxide, approximately 70 μm-thick; and separator 7 is a laminate separator made of a polypropylene film and a polyethylene film, which are sheets of porous insulator resin foils 25 μm thick each. As shown in FIG. 4, a 100 μm-thick aluminum positive electrode terminal 2 and a 100 μm-thick nickel negative electrode terminal 3 are attached to the electrode collectors (uncoated sections) 2a and 3a, respectively, of anode elements 5 and cathode elements 6 by means of ultrasonic welding. Continuously, an aluminum terminal that is 100 μm in thickness is attached to the positive electrode collector (uncoated sections) 2a by means of ultrasonic welding so as to extend outwards from collector 2a in the direction perpendicular to the extension sides of the positive/negative electrode terminals, to provide third terminal

4. While ultrasonic welding is employed in the first embodiment, any method capable of providing electrical conductivity, such as resistance welding or riveting, may be employed. In other words, the invention does not have a feature with respect to the bonding method. Continuously, as shown in FIG. 5, the electric-power generating element is wrapped with about a 100 μm-thick laminate film of aluminum foil 9, into which is injected the electrolyte produced by dissolving lithium phosphate hexafluoride with non-aqueous solvent of propylene carbonate and methyl ethyl carbonate; and the laminate film is then sealed by means of hot-melt fusion-bonding under reduced pressure, to provide a secondary battery. The size of cathode element 6 is 70 mm x 125 mm, the size of the anode element is 65 mm x 120 mm, the size of separator 7 is 75 mm x 130 mm, the sizes of positive and negative lead taps 2, 3 is 40 mm x 10 mm and the size of the third terminal is 30 mm x 5 mm. The size of the laminate film for the casing is 95 mm x 160 mm and the width of the hot-melt fusion-bonding seal is 10 mm.

In a second embodiment, a flat laminate-film secondary battery of the present invention is provided in which a third terminal of nickel 3 is formed to extend from negative electrode collector 2a.

In a third embodiment, a flat laminate-film secondary battery of the present invention is provided in which anode elements 5 and cathode elements 6 are alternately stacked sandwiching separator 7 therebetween so that electrode collector 2a and electrode collectors 3a (both being the uncoated sections) of the first embodiment will be arranged opposite each other, and third terminal 4 of aluminum is formed extending from an end of electrode collector (uncoated section) 2a of anode elements, perpendicularly to the direction in which positive and negative electrodes 2, 3 extend and further in the position sufficiently remote from positive electrode terminal 2, as shown in Fig. 6.

In a fourth embodiment, a flat laminate-film secondary battery of the present invention is provided in which third terminal 4 of nickel is formed extending from an end of electrode collector (uncoated sections) 3a of cathode elements 6 of the third embodiment 3 in the position sufficiently remote from negative electrode terminal 3.

The constituent elements and the dimension of the constituent elements employed in the second to fourth embodiments are identical to those employed in the first embodiment. These embodiments differ from one another only in that the directions in which the positive and negative electrodes extend differ and in that the potential applied to the third terminal differs.

The flat laminate-film secondary batteries disclosed in the first to fourth

embodiments have 4.2 V (2 Ah) characteristics. The thickness of the battery is 4 mm, and the weight is 80 g.

Table 1 represents the result of the measurements of the temperature in the interior of flat laminate-film secondary battery 1 disclosed in each of the first to fourth embodiments. The measurements were carried out as follows. The forced discharge of 50 A for 5 sec. was performed at an ambient temperature of 20°C, and then the maximum attained temperatures were measured at positive and negative electrode terminals 2, 3, third terminal 4 and three places on the surface of the flat laminate-film secondary battery. Temperature rises (differences) with respect to the surface temperatures were determined at each site. Table 1 represents the temperature rises. Meanwhile, the temperatures of the positive and negative electrode terminals and the surface temperature are equivalent to the method of measuring temperature in the interior of a flat laminate-film secondary battery.

Table 1

	1st embodiment	2nd embodiment	3rd embodiment	4th embodiment
Temperature difference (°C) of positive electrode terminal	30.5	29.5	30.0	30.5
Temperature difference (°C) of negative electrode terminal	49.5	48.5	49.5	48.5
Temperature difference (°C) of third terminal (on the positive electrode collector)	3.5	—	0	—
Temperature difference (°C) of third terminal (on the negative electrode collector)	—	9.0	—	1.0

(since the surface temperature the cell is a reference temperature, it is not indicated)

As is seen from Table 1, the temperature differences of the positive and negative

electrode terminals (the differences from the surface temperature of the cell) in the first and second embodiments are approximately 30°C at the positive electrode terminal and a little under 50°C at the negative electrode terminal, indicating that heat generation is significantly large. The temperature differences in the third terminal, in contrast, are 3.5°C on the positive electrode collector and 9.0°C on the negative electrode collector, indicating that the temperature in the third terminal approximates the internal temperature of the cell with much higher accuracy than the method of measurement according to prior art.

In the third and fourth embodiments as well, the temperature differences of the positive and negative terminals (the differences from the surface temperature of the cell) are approximately 30°C at the positive electrode terminal and a little under 50°C at the negative electrode terminal, indicating that heat generation is significantly large. In the meantime, the temperature differences of the third terminal, in contrast, are 0°C on the positive electrode collector and 1.0°C on the negative electrode collector, indicating that the third terminal exhibits a temperature nearer the internal temperature of the cell than the temperatures of the third terminals in the first and second embodiments. The reason for this is considered to be that the third terminals of the third and fourth embodiments are attached to positions sufficiently remote from the positive and negative electrode terminals in order to be more insusceptible to the effect of heat generation in the positive and negative electrode terminals than the cases of the first and second embodiments.

Accordingly, the flat laminate-film secondary battery provided with the third terminal of the present embodiment allows measurement of the internal temperature of a cell with a markedly higher accuracy than the conventional one, in any of the first to fourth embodiments. In addition, since the temperature difference of the third terminal tends to exhibit a lower value on the positive electrode collector than on the negative electrode collector, it can be seen that the fourth embodiment is a flat laminate-film secondary battery of the present invention capable of obtaining the nearest temperature value to the internal temperature of a cell from the third terminal.

As a fifth embodiment, an embodiment for constructing a storage battery using the flat laminate-film secondary batteries described in the fourth embodiment is shown in FIG. 7. In FIG. 7, the storage battery is structured in such a way that ten flat laminate-film secondary batteries 1 are stacked with the positive and negative electrode terminals for charge/discharge being serially connected directly and further third terminals 4 being directed in the same direction. This structure is built by stacking flat laminate-film secondary batteries 1 of the fourth embodiment with the positive electrode terminals and

the negative electrode terminals individually connected directly to make serial connections after connecting temperature-detecting sensors 10 and lead wires 11 for a cell balancer circuit to third terminals 4 of flat laminate-film secondary batteries 1. As can be seen from FIG. 7, the flat laminate-film secondary batteries are stacked to realize the highest volumetric efficiency without providing any temperature-detecting sensor, an elastic element such as a sponge sheet, or the like being provided between successive secondary batteries. As shown in FIG. 8, a storage battery is constructed by connecting temperature-detecting sensor 10 and lead wires 11 for a cell balancer, which extend from third terminals 4 of flat laminate-film secondary batteries 1 built as described above, to control circuit 12 and by wrapping the built-up flat laminate-film secondary batteries with an aluminum casing 13 of 2 mm in thickness.

As shown in FIG. 9, the storage battery of the prior art was built through the use of secondary batteries each of which had basically the same structure as the flat laminate-film secondary battery of the fourth embodiment except that it lacked the third terminal. The conventional storage battery was built up through the processes of attaching temperature-detecting sensor 10 to the central region of the surface of each secondary battery; connecting each lead wire 11 for a cell balancer circuit to the positive-electrode-terminal side of the positive and negative electrode terminals for charge and discharge; directly connecting the positive electrode terminals and the negative electrode terminals individually to form serial connections; and stacking the secondary batteries sandwiching elastic sponge boards (15g in weight, 2 mm x 70 mm x 120 mm in size) between successive secondary batteries. After stacking the secondary batteries in this way, each of temperature-detecting sensors 10 and each of lead wires 11 for a cell balancer circuit were connected to control circuit 12, and the whole battery system was wrapped with aluminum casing 13 of 2 mm in thickness like the embodiment shown in FIG. 8. A conventional storage battery was produced in this way.

Table 2 represents volume and weight ratios of a storage battery through the use of flat laminate-film secondary batteries of the fifth embodiment and a storage battery of the prior art. Values in Table 2 indicate the volume and weight ratios of the storage battery of the fifth embodiment, based on volume and weight of the storage battery of the prior art.

Table 2

	Volume ratio	Weight ratio
Storage battery of the fifth	0.65	0.9

embodiment		
Storage battery of the prior art	1	1

As can be seen from Table 2, the volume ratio of the storage battery of the fifth embodiment is decreased by 45%, compared to that of the storage battery of the prior art and the weight ratio of the storage battery of the fifth embodiment is also decreased by 10%, so that it is possible to improve volume and weight densities.

[Effects of the Invention]

According to the flat laminate-film secondary battery of the present invention, the third terminal having the same potential as the potential of either the positive or negative electrode is extended from the electric-power generating element, in addition to the positive and negative electrode terminals for charge and discharge.

When a storage battery is constructed through the use of flat laminate-film secondary batteries having the third terminal, the temperature measurement of the third terminal allows an accurate measurement of the interior temperature of the flat laminate-film secondary battery and an accurate estimation of the cycle life of the storage battery.

In addition, since the third terminal has the potential and it is thus possible to further provide the third terminal with the function of attaching the lead wires for the cell balancer circuit, the extension of the control wires can be easily performed in constructing the storage battery, thereby simplifying the processes of constructing the storage battery.

Furthermore, it is not necessary to extract the lead wires for the cell balancer circuit from the positive and negative electrode terminals for charge and discharge, so that it is possible to optimize the length of the electrode terminal to be as small as possible. In addition, since direct connection of the terminals is easily made, it is possible to reduce the internal resistance of the storage battery.

[Brief Description of the Drawing]

[Fig.1]

Fig. 1 is a perspective view of a flat laminate-film secondary battery according to an embodiment of the present invention.

[Fig.2]

Fig. 2 is a perspective view of a conventional flat laminate-film secondary battery.

[Fig.3]

Fig. 3 is a diagram illustrating a structure of an electric-power generating element.

[Fig.4]

Fig. 4 is a diagram illustrating a structure of an electric-power generating element according to an embodiment of the present invention.

[Fig.5]

Fig. 5 is a diagram illustrating a structure of a flat laminate-film secondary battery.

[Fig.6]

Fig. 6 illustrates a third embodiment of the present invention.

[Fig.7]

Fig. 7 is a diagram illustrating a structure of a storage battery using flat laminate-film secondary batteries according to an embodiment of the present invention.

[Fig.8]

Fig. 8 is a diagram illustrating an example of building a storage battery using flat laminate-film secondary batteries of the present invention.

[Fig.9]

Fig. 9 is a diagram illustrating a process of assembling a storage battery using conventional flat laminate-film secondary batteries.

[Description of Numbers]

1: flat laminate-film secondary battery

2: positive electrode terminal

2a: uncoated section of anode element

3: negative electrode terminal

3a: uncoated section of cathode element

4: third terminal

5: anode element

6: cathode element

7: separator

8: electric-power generating element

9: laminate-film

10: temperature-detecting sensor

11: lead wire for cell balancer

12: control circuit substrate

13: battery casing

14: sponge-sheet (elastic material)

Fig. 1

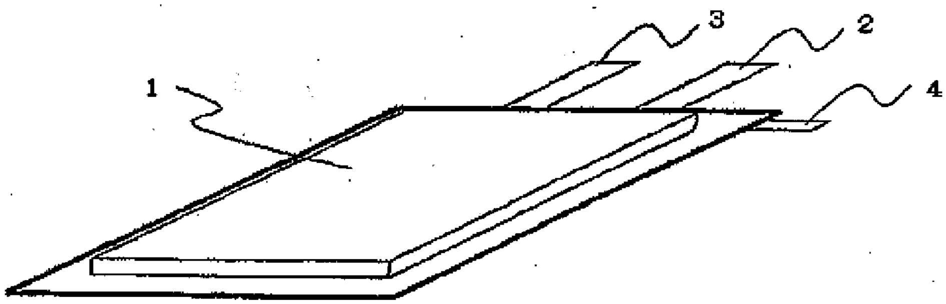


Fig. 2

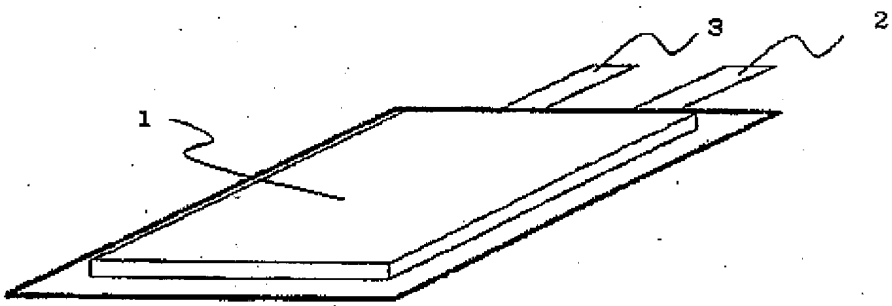


Fig. 3

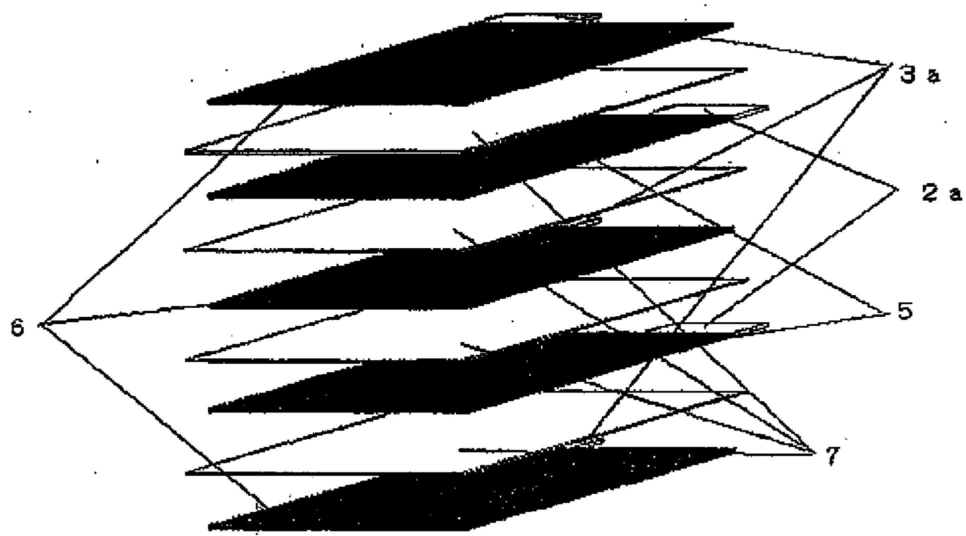


Fig. 4

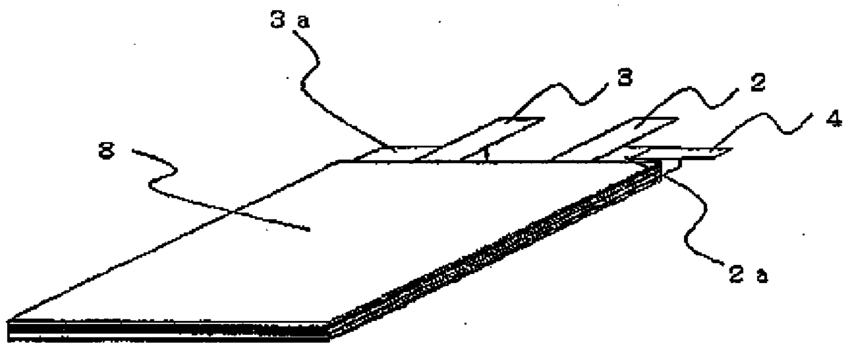


Fig. 5

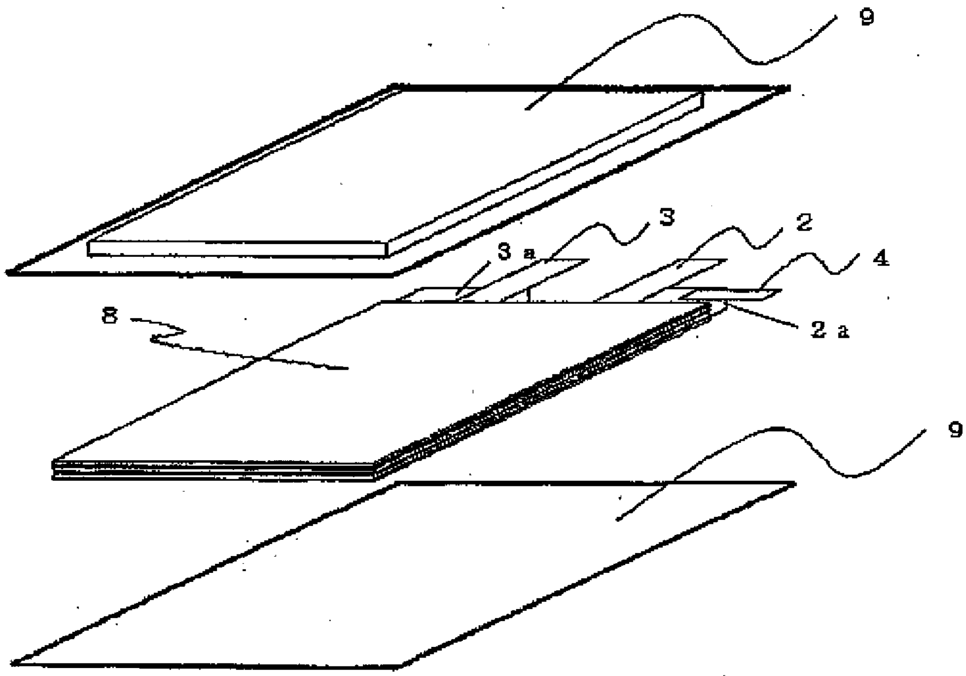


Fig. 6

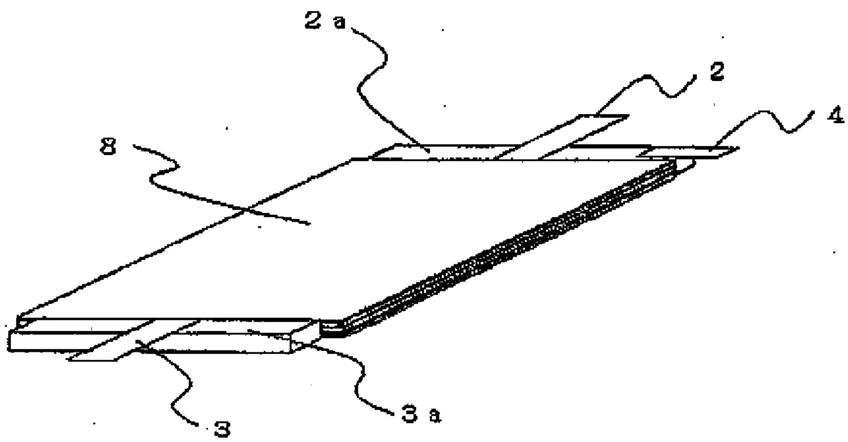


Fig. 7

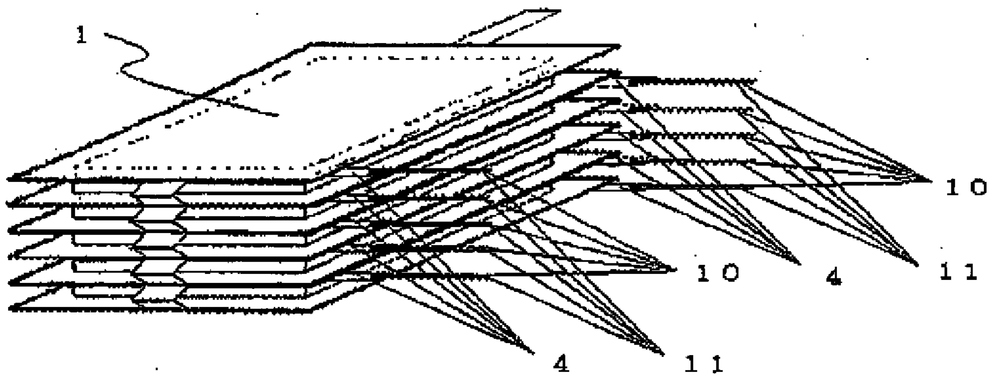


Fig. 8

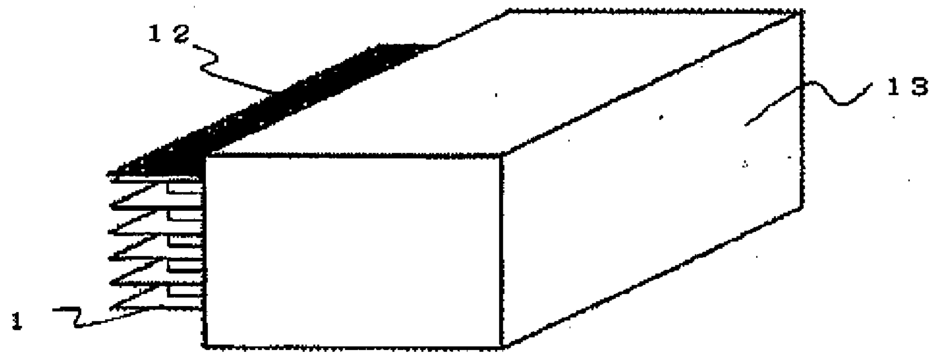
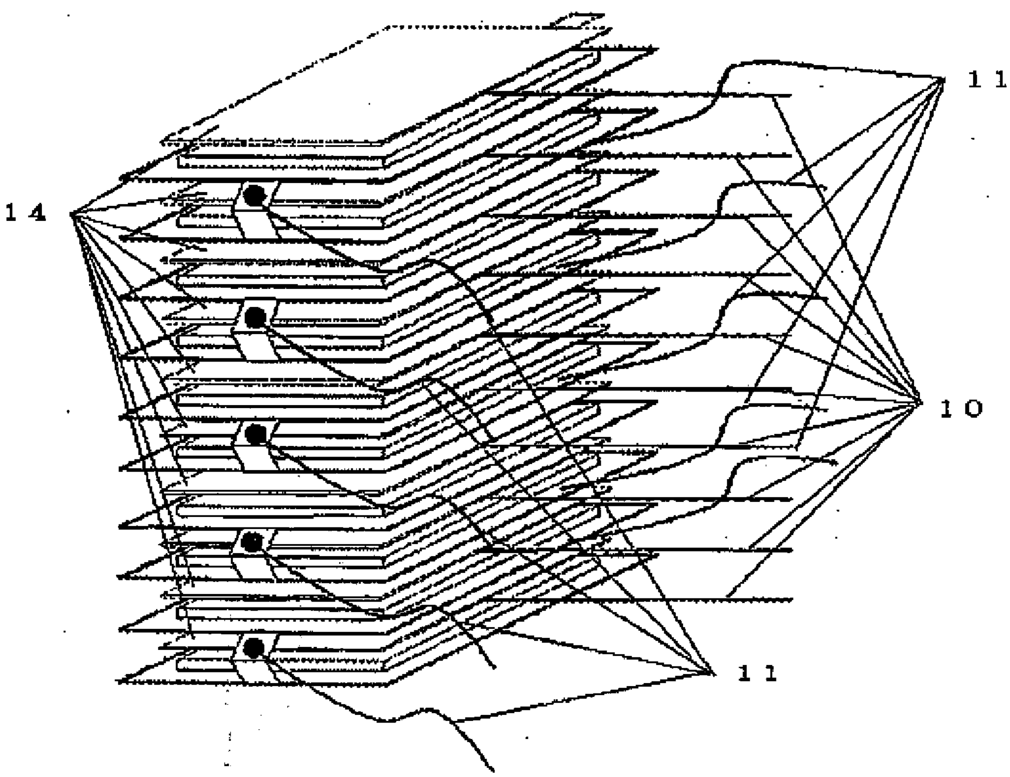


Fig. 9



[Document Name] Abstract

[Abstract] To provide a structure of a secondary battery that is provided with a third terminal having the same potential as either the positive or negative electrode in addition to positive and negative electrode terminals of a flat laminate-film secondary battery, that improves the accuracy in the measurement of the temperature rise (or heat generation) in the secondary battery caused by a rapid charge/discharge operation as compared to the conventional one, that reduces the internal resistance of a storage battery and that allows easy construction of the storage battery.

[Problems] To provide a means for allowing measurement of the internal temperature of a flat laminate-film secondary battery with higher accuracy than the conventional one and to provide a storage battery having improved volume and weight densities and lower internal resistance with the addition of a simple fabricating process.

[Means for solving the problems] The conventional flat laminate-film secondary battery is provided with a third terminal is formed to extend in the direction that is perpendicular to the extension sides of the positive and negative electrode terminals. At this time, the third terminal is connected to an electric-power generating element constituting the secondary battery and is formed to have the same potential as either the positive or negative electrode. In this way, it is possible to solve the problems by providing a third terminal to the conventional flat laminate-film secondary battery.

[Selected Figure of the Drawings] FIG. 1